

COMBINED SCIENCE

<p>Paper 5129/12 Multiple Choice</p>
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<i>Question Number</i>	<i>Key</i>	<i>Question Number</i>	<i>Key</i>
1	B	21	C
2	A	22	C
3	C	23	B
4	C	24	B
5	C	25	C
6	B	26	A
7	D	27	A
8	D	28	B
9	C	29	B
10	A	30	D
11	B	31	A
12	D	32	B
13	B	33	B
14	D	34	C
15	A	35	D
16	D	36	A
17	A	37	A
18	D	38	C
19	B	39	C
20	B	40	D

General comments

Candidates found no question to be very easy and only **Question 31** to be very challenging. In **Questions 28, 29, 37, 39** and **40** a distractor attracted a greater response than did the key, indicating uncertainty and guessing even among the stronger candidates.

Comments on specific questions

Question 1

Many candidates correctly identified cells W and Y as the two organisms which can synthesise their own food, since both diagrams showed cells containing labelled chloroplasts.

Question 2

Half of the candidates who sat this paper were able to correctly link the movement of the oxygen molecules from high to a low concentration by diffusion. Many of the candidates had correctly identified the direction, but had linked the movement to the process of osmosis, which proved to be a strong distractor and therefore were not awarded credit.

Question 3

Many of the candidates knew that enzymes act as catalysts in biological reactions. "Amino acids" was a strong distractor as candidates had clearly linked amino acids to proteins.

Question 4

Candidates found this question challenging with option **D** proving to be a very strong distractor.

Question 5

The majority of candidates knew that the function of X in the diagram was to store bile.

Question 6

Many of the candidates were able to correctly identify that transpiration was the loss of water vapour from the stomata. A number of the weaker candidates had linked the loss of water vapour to the root hairs.

Question 7

This question discriminated well between the candidates and it was evident that the stronger candidates were able to link an increased white blood cell count and an unchanged red blood cell count to the patient who had been infected.

Question 8

This question discriminated well between the candidates. A number of the candidates knew that lactic acid was the product of anaerobic respiration in muscle cells, however, distractor **C** was a strong distractor as many also linked this to a large amount of energy, rather than a small amount of energy.

Question 9

Many of the candidates found this question challenging, as they thought that the kidneys removed urea and water whilst only carbon dioxide is removed by the lungs. Distractor **D** therefore proved to be a very strong distractor. Future candidates would benefit from understanding that water is also removed by the lungs.

Question 10

This question discriminated well between the candidates. Many of the candidates knew that the ciliary muscle contracted, however, only the strongest correctly linked this to the suspensory ligaments loosening. Distractor **B** was therefore a strong distractor.

Question 11

The majority of candidates were able to correctly identify that heroin was a depressant.

Question 12

Many of the candidates knew that sulfur dioxide damages gas exchange surfaces, however, a number opted for carbon dioxide and nitrogen.

Question 13

Just under half of all candidates correctly identified that a balanced diet and low stress would be least likely to stop menstruation. However, the distractor featuring an unbalanced diet and high stress was a strong distractor with a similar number of candidates opting for this response. This suggests that candidates had misinterpreted the question and would suggest that more careful reading of the stem would be advantageous.

Question 14

A majority of the candidates recognised that ethanol is separated from an aqueous solution by fractional distillation.

Question 15

A significant proportion of the weaker candidates thought that a gas has the lowest kinetic energy and chose option **D**.

Question 16

This question was well answered by the stronger candidates however there is some confusion amongst the weaker candidates about what the mass number represents and they chose options **A** and **C**.

Question 17

Most of the candidates recognised that an ionic compound is formed between a metal and a non-metal but a significant proportion of these candidates thought that the atoms share electrons.

Question 18

The stronger candidates were able to work out the stoichiometry of the equation.

Question 19

There was evidence of widespread guesswork even amongst the stronger candidates. Candidates were expected to recognise that the gas given off is ammonia and that ammonium salts react with bases to produce ammonia.

Question 20

There was evidence of guesswork amongst the weaker candidates.

Question 21

The properties of the Group VII elements are not well known by the candidates. There was evidence of guesswork amongst the weaker candidates.

Question 22

The properties of metals are well known by many of the candidates.

Question 23

There was evidence of widespread guesswork particularly amongst the weaker candidates.

Question 24

The fact that carbon dioxide turns limewater milky is well known by a majority of the candidates.

Question 25

The conditions used in the manufacture of ammonia are well known by the stronger candidates.

Question 26

The relationship between molecular formula of a compound and general formula and homologous series is not well understood by many of the candidates.

Question 27

There was evidence of widespread guesswork even amongst the stronger candidates.

Question 28

This question showed good discrimination although a significant number of stronger candidates mistakenly used the edge of the vernier as the zero and chose option **A**. More candidates chose option **C** than chose the key option **B**.

Question 29

This question also showed good discrimination along with more candidates choosing option **A** than the key, option **B** attracted some of the stronger candidates.

Question 30

This question was well answered with very good discrimination. Options **B**, using the final volume figure, and **C**, the initial volume figure, were chosen by weaker candidates.

Question 31

That the Sun's energy is responsible for many of the resources used to generate electricity is a new to this type of question. Two thirds of the candidates, including a significant number of stronger ones, chose option **D** rather than the key, option **A**. Option **B** also attracted many stronger candidates.

Question 32 and Question 33

Both were well answered and showed good discrimination with weaker candidates favouring option **D** over option **C** in **Question 32** and in **Question 33** option **C** was the most popular of the distractors.

Question 34 and Question 35

Again they were answered well and showed very good discrimination with option **A** the most popular distractor in **Question 34** and option **B** in **Question 35**.

Question 36 and Question 37

Both were also answered well with very good discrimination. In **Question 36** weaker candidates, thinking object P repelled object Q, chose options **B** and **D** in equal numbers and in **Question 37** they chose option **B**, possibly misreading the current in the bulb as 2 A rather than 0.2 A.

Question 38

This question discriminated well with distractors **B** and **D** proving equally popular between weaker candidates and, in **D**, some of the stronger ones too.

Question 39

This question showed that the direction of the induced e.m.f. opposes the change producing it was not well understood by the candidates with more choosing option **B** than chose the key, option **C**, and stronger candidates choosing both options **A** and **B**.

Question 40

This question showed that the effect of a beta-particle emission on a nucleus was not well known with option **A** a more popular choice than option **D**, the key. Option **C** also attracted some stronger candidates.

COMBINED SCIENCE

Paper 5129/22
Theory

General comments

The answers to the questions on the Physics Section of the paper, which required an explanation, were frequently answered in terms of a description of the experiment. In Physics calculations, candidates should be encouraged to write down the formula using the correct symbols for the quantities. The candidates' responses to some of the recall questions in the Biology section of the paper were generally very good but those questions that required some explanation were less well understood. The Chemistry questions were less well answered than in previous examinations.

Comments on specific questions

Question 1

- (a) A large proportion of the candidates described what happened in the experiment rather than explain in terms of forces. The fact that the force in the springs increase and decrease as the trolley moves from left to right was not understood by a large proportion of the candidates.
- (b) Many of the candidates were able to state that the addition of a load on the trolley causes the trolley to slow down.
- (c) The formula $F = ma$ is well known by a large proportion of the candidates although some of the weaker candidates did not rearrange the formula correctly.
Answer: 1.8 kg

Question 2

- (a) (i) The strongest candidates were able to name the piece of apparatus as a condenser.
- (ii) Candidates should be aware that cold water enters the condenser at the bottom so that the whole of the condenser is full of water so that the ethanol vapour is cooled efficiently. Many of the candidates were under the misapprehension that the water in the condenser mixes with the ethanol vapour as it distils.
- (iii) The idea that ethanol particles are furthest apart and moving in rapid random motion when the ethanol is a vapour needs to be understood by the candidates.
- (b) The candidates were expected to state the general name given to liquids in which solids dissolve. Many of the candidates thought that a specific example of a solvent was required and gave the answer alcohol.
- (c) The structure of ethanol was well known by the stronger candidates.

Question 3

A majority of the candidates were able to gain full credit on this question. The fact that ions are absorbed by the root hair cells was less well known than the answers.

Question 4

- (a) A large proportion of the candidates described the diagram without giving a description of the experimental procedure. Candidates were expected to state that the initial length of the test material is measured and the mass is increased and so that the extension of the test material can be calculated.
- (b) The stronger candidates recognised that the test material returned to its original shape when the mass is removed.

Question 5

- (a) (i) The names given to the two numbers were well known by the stronger candidates. The difference between the relative atomic mass and the nucleon (mass) number is not appreciated by a large number of the candidates.
- (ii) The electronic structure of fluorine is well known by many of the candidates.
- (iii) Many of the candidates were able to state that the fluorine atom has seven electrons in its outer shell but not all of these candidates were able to state that fluorine is in Group VII of the Periodic Table. Other possible answers such as fluorine is on the right of the Periodic Table or the fluorine atom gains one electron to form a negative ion were seen less frequently.
- (b) (i) The stronger candidates were able to name the compound as magnesium fluoride.
- (ii) Many of the candidates knew that an ionic compound is formed between a metal and a non-metal.

Question 6

- (a) The meaning of an arrow was well known by the candidates.
- (b) Many candidates were able to determine the number of herbivore species and carnivore species.
- (c) Many of the candidates were able to state why the population of would decrease but candidates had difficulty explaining why the population of impala would increase. Candidates were expected to state that the population of leopards would decrease so there would be more impala.
- (d) The idea that a short food chain is better for the leopard because energy is lost between each trophic level through movement, respiration, excretion, etc. is not well understood by the candidates.

Question 7

- (a) The stronger candidates recognised that the air in point **A** in the generator is heated by the solar radiation and becomes less dense and therefore rises to point **B**.
- (b) Many of the candidates knew that black is a good absorber of radiation. The idea that the air becomes hotter or more air rises so this increases the movement of the generator and increases the production of electricity was less well understood.
- (c) The type of thermal energy transfer was known only by the stronger candidates.

Question 8

- (a) A large proportion of the candidates focussed on the charge on the sulfate ion and ignored the formula, $M_2(SO_4)_3$, in the equation and therefore assumed a 1:1 ratio in the compound and chose M^{2+} .
- (b) (i) Many of the candidates understand how to calculate the relative molecular mass of a substance. In this question a number of the candidates ignored the formula, $M(OH)_3$, in the equation and therefore gave the answer as 54.
Answer: 27

- (ii) This question was well done by many of the candidates. Those candidates who had difficulty calculating the mass of water produced from 156 g of the metal hydroxide invariably were able to use simple proportion to correctly calculate a value of the mass obtained from 7.6 g of metal oxide.
Answer: 108
0.54

- (c) (i) Many of the candidates know that the pH of a solution that turns universal indicator red is in the range 1 to 3.
- (ii) The strongest candidates knew that the reaction between a metal hydroxide and an acid is a neutralisation reaction.

Question 9

- (a) A significant proportion of the candidates were able identify the type of wave however the explanation was less well understood. Candidates were expected to state that the vibration in a transverse wave is perpendicular to the direction of the wave direction.
- (b) (i) The stronger candidates were able to deduce the number of complete wavelengths shown in **Fig. 9.1**.
Answer: 3
- (ii) The stronger candidates recognised that the wavelength of the wave is determined by dividing the distance between **A** and **B** by the number of complete wavelengths.
Answer: 5 cm
- (iii) The formula for calculating the speed of the movement of the track was quite well known. Candidates who used an incorrect value from **(b)(ii)** correctly gained credit for the calculation.
Answer: 4 cm/s

Question 10

- (a) Some of the differences between an artery and a vein were known by many of the candidates. There was some confusion amongst the candidates about which of the vessels contained valves.
- (b) The causes of coronary heart disease are well known by many of the candidates.
- (c) The vast majority of the candidates are unaware that a capillary has a cell wall that is one cell thick in order for rapid diffusion of gases between the blood and respiring cells occurs.

Question 11

- (a) The catalyst used in the manufacture of ammonia was known only by the stronger candidates.
- (b) Many of the candidates identified nitric acid as the acid used to make ammonium nitrate.
- (c) The stronger candidates were able to balance the equation.
- (d) (i) Candidates should be aware that liquids can be separated by fractional distillation because they have different boiling points.
- (ii) Many of the candidates answered this question by giving a use of hydrogen rather than the source of hydrogen.
- (e) There is confusion amongst the candidates between element and compound. The element present in ammonium nitrate which is needed for growth of plants is nitrogen.

Question 12

- (a) A significant proportion of the candidates were able to identify the testa and plumule on **Fig. 12.1**.

- (b) This question was well answered by the stronger candidates but there is some confusion amongst many candidates who think that sunlight is a necessary environmental condition for seeds to germinate.
- (c) The stronger candidates were able to state the name of the enzyme and the product of digestion.
- (d) The methods of seed dispersal were well known by many of the candidates.

Question 13

- (a) The circuit diagram was well done by many of the candidates. Candidates should be encouraged to use the correct symbols for the ammeter, voltmeter, resistor and lamp. The correct symbol for a lamp was less well known than the other symbols.
- (b) The calculation of the charge that passes through the circuit was well done by a majority of the candidates. The unit of charge is less well known by some of the candidates.
Answer: 130C

Question 14

Many of the candidates were able to complete the sentences about the structure and properties of materials. The properties of a compound formed between a metal and a non-metal, an ionic compound, were less well known particularly the low volatility of these compounds.

Question 15

The parts of the body that carry out certain functions are well known by a large majority of the candidates.

Question 16

- (a) There is a degree of confusion amongst the candidates about the meaning of the term hydrocarbon. Candidates should be aware that a hydrocarbon is a **compound** that contains carbon and hydrogen only rather than a mixture of carbon and hydrogen.
- (b) The test that distinguishes between an unsaturated hydrocarbon and a saturated hydrocarbon is not well known by a vast majority of the candidates.
- (c) The fact that the boiling points of members of a homologous series increase as the number of carbon atoms increase is known by the stronger candidates.

Question 17

- (a) The stronger candidates were able to state that one end of rod **X** rotates towards rod **Y** because the rods have opposite charges. There is some confusion amongst the candidates between charges and magnetic poles.
- (b)(i) The calculation of the average time proved to be difficult for many of the candidates.
Answer: 19
- (ii) A significant proportion of the candidates were able to state that as the distance between the rods increases the time taken for the rods to rotate through 50° also increases. The strongest candidates recognised that the distance is not directly proportional to the time.
- (iii) A large proportion of the candidates simply re-stated the answer to (b)(ii) rather than give an explanation of the results. Candidates were expected to state that the attractive force between the rods is greater when the rods are closer together.